

and a broad new scale index for Indian summer monsoon variability. Satyan and others in the 25th paper deal with climate predictability and variability studies using atmospheric general circulation models. Gopala Krishna and Suryachandra Rao have reported that the International Tropical Ocean Global Atmosphere (TOGA) programme has been implemented on a few shipping routes in the Indian Ocean. It is an interesting paper giving a total historical monthly sea surface temperature data. The authors point out that it is necessary to have long-term stationary position data for a better understanding of Rossby Wave characteristics in the Bay of Bengal. The 27th paper by Damle examines the basic concepts of Wind Profiler/RAS system and gives details of indigenous development undertaken in India. He has also outlined the future course of action in this area. The last paper by Dash and others describes the Atmospheric and Oceanic Modelling Studies at IIT, Delhi. It is basically a compilation of the results of

six projects sponsored by the Department of Science and Technology.

In a nutshell, this volume provides an up-to-date knowledge of various projects implemented by the Department of Science and Technology, and their results in the three major areas of Deep Continental Studies, Glaciology and Atmospheric Sciences. The papers are precisely written and provide in-depth information. The authors, the editors and the Department of Science and Technology need to be complimented for bringing out a timely publication. I have no hesitation in recommending this volume to all the researchers and libraries.

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RESEARCH HIGHLIGHTS IN EARTH SYSTEM SCIENCE. Special Volume 2,
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This is second of the two volume series on research highlights in earth system science brought out by the Earth System Science Division of the Department of Science and Technology in collaboration with the Indian Geological Congress. While the first volume focuses attention on the 'Deep Continental Studies, Glaciology and Atmospheric Sciences (reviewed in this issue, p.607), this second volume under review focuses attention on 'Seismicity' and has been edited by O.P. Varma.

The volume consists of four sections: (1) Seismicity and Seismotectonics, (ii) Neotectonics and Palaeoseismology, (iii) GPS, Geodetic and other Geophysical studies and (iv) Strong Motion and Earthquake Engineering studies. It is a very good attempt to bring together the highlights of the research investigations sponsored by the Department of Science and Technology (DST), Government of India, during the last decade.

In the first section there are eleven research papers on the DST sponsored projects. At the outset, I must say that this section is not quite up to the mark. It looks to me as if the papers were not pre-reviewed. Some papers, however, are well presented and informative, like those by S.N. Bhattacharya et al. on 1997 Jabalpur earthquake;

Rastogi on the RIS at Koyna-Warna; Kusala Rajendran's on triggered seismicity at Koyna and S.K. Srivastava et al. on the 1999 Chamoli Earthquake. The information presented is not new as these are published elsewhere, but now collated and available at one place.

Section two is found to be comparatively better presented. It gives a good account of information on the palaeoseismic and neotectonic evidences; two from the Himalayan region, three from the shield area and one from the Gangetic plain. One short note is given by Gupta et al. on the drilling results in the Killari earthquake epicentre area, confirming reactivation of an old fault. The Himalayan palaeoseismic study is interesting, and warrants more research projects and detailed investigations in the Himalaya. The palaeoseismic evidence in the Killari area (by Rajendran and Rajendran) gives a comprehensive account and an interesting case study in the shield area. Such palaeoseismic studies deserve encouragement.

In the third section, GPS, geodetic and other geophysical studies are presented. The first paper by Issar gives a brief status of the geodetic investigations in the Himalaya by the Survey of India. He has also given an account of the GPS and geodetic studies in Peninsular India in the third

paper. These two papers do not discuss the results or give any interpretation; the status/data are however, very useful. The references in both the papers are not cited in the text which is a lapse by the author/editor. A good account of the GPS measurement techniques, its contribution and accuracy is given by Reddy. This is a new technique, and DST is launching a bigger programme in the country. The readers and the beginners would be very much benefited by this paper.

Two papers are included on Magnetotelluric (MT) investigations, one by S.G. Gokarn et al. and the other by Arora and Reddy. The first paper discusses the results obtained by the survey in Delhi and Latur areas, and the latter discusses the results obtained in the Himalayan foothills region. The results are interesting and would be useful for better modelling/understanding of the earthquake processes and the role of conductive layers that are identified by the MT surveys at depth in generating earthquakes. Radon/Helium studies for earthquake prediction by H.S. Virk, is a good attempt to monitor precursors. But precursor anomalies are yet to be understood, as there is correlation as well as non-correlation. In this context, I would like to suggest to the readers to peruse recent v.338, 2001 of *Tectonophysics*. This volume has dealt with in detail problems of earthquake prediction and precursors. A good attempt has been made by S. Mukherjee in preparing a GIS map using remote sensing, geochemistry and geophysical data in Delhi area; the work, however, is not well presented. In this section, the last paper is on gravity and GPS measurements in Ladakh, NW Himalaya by P. Banerjee and Satyaprakash. I think this is a commendable job done by the authors on a prestigious and adventurous project of the DST. The observed geoid and gravity anomalies at the plate boundary, north of Leh, is very interesting which clearly demarcates the plate boundary. The authors have argued that the present surface signature of the plate boundary, the Indian Tsangpo Suture Zone is located further south; the actual signature of the Suture Zone is possibly masked by the Ladakh batholith which lies right over the plate boundary to the north of Leh. This is an interesting and provocative finding. They have

further suggested that the orthometric height measurement by the GPS eliminates the levelling measurements in a hostile terrain. The authors deserve congratulations for a good piece of work in a very difficult terrain, and for the good presentation.

Section four contains four papers on strong motion and earthquake engineering studies. The first paper by S.K. Jain et al has given detailed photographs of the structural damages due to the 1997 Jabalpur earthquake and discusses the engineering aspects. The authors have suggested to develop "Earthquake Engineering Industry" that can take care appropriate repairing and strengthening of the damaged structures after an earthquake. The second paper by P. Agarwal and S.K. Thakkar describes shock table test. The test results demonstrate the mode of failures, crack pattern and behaviour of the models with different strengthening measured under shock loading. Some useful recommendations are made for earthquake resistant design of the houses. Similarly, the study of the strong motion characteristics of the 1991 Uttarkashi earthquake by M. Shrikhande et al. has brought out interesting results. They have observed that the site conditions have significant influence on the recorded accelerograms and ground motion change significantly when resolved into principal components. The last paper in this section is on the strong motion studies in the Himalaya by B. Chandra et al. They have emphasized the usefulness of the strong motion array in the earthquake prone areas. This paper has given many references in the list but none is cited in the text!

In conclusion, this volume would be very useful to earth scientists and the seismologist-community in particular. I only wish that the papers, particularly written by junior authors/researchers, were properly reviewed and edited to give the book an international standard that it actually deserves.

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